

# Élan Am386SC300 Device Solution For Systems Using Micro Power Off Mode

## Application Note



Advanced  
Micro  
Devices

*The Élan Am386SC300 device includes a built-in 146818A-compatible Real Time Clock (RTC) with 114 bytes of static random access memory (SRAM). The RTC SRAM is designed to hold configuration data and to maintain accurate time and date when the rest of the system is powered down; that is, when Élan is in the PMU Off mode. This state is called the Micro Power Off mode.*

## MICRO POWER OFF MODE

The Élan Am386SC300 device includes a built-in 146818A-compatible real-time clock (RTC) with 114 bytes of static random access memory (SRAM). The RTC SRAM is designed to hold CMOS configuration data and to maintain accurate time and date when the rest of the system is powered down (i.e., when the Élan device is in the PMU Off mode). This state is called the Micro Power Off mode.

As a hardware complement to the PMU Off mode in the Élan device, the Micro Power Off mode allows the system to conserve battery power by removing all power to the device except for the AVCC and VCC pins. Maintaining power on these pins allows the RTC to remain powered up, preventing the system from losing its CMOS configuration, time, and date data.

The integration of this block into the chip means that less support logic is required when implementing an AT-compatible system.

## Real-Time Clock

The RTC is designed to operate properly, while in Micro Power Off mode, at voltages all the way down to 2.4 volts with the power consumption typically around 30  $\mu$ A. (See power consumption data in data sheet for register settings that will affect power consumption during Micro Power Off mode). Any source below 2.4 volts will not guarantee proper functionality, which could mean the loss of system configuration data or the date and time. The system designer should implement a switching circuit to allow a clean transition from the main power source to the backup battery source when the system is put into Micro Power Off mode. See Figure 1 for a circuit example. Table 1 shows the materials required for this particular circuit.

## Power Loss Bit (VRT)

VRT, the power loss bit (Index 0DH, bit 7 of the RTC map), is intended to provide a method of determining when the RTC core voltage supply has dropped below an acceptable level. This bit should go to a zero when a low backup battery condition has been detected. On the Élan device, the 32-kHz clock, which is used by the RTC to maintain the time, stops oscillating before the power loss bit or the RAM contents get cleared. This prevents the RTC from keeping accurate time, even though the RAM contents are still valid and VRT is still set.

This condition presents a problem because BIOS will usually perform a checksum of the RAM contents or look at the VRT bit in order to determine the validity of the CMOS configuration data and the RTC time and date data, then notify the user that they are no longer valid.

## Suggested Workarounds:

- Have the user manually determine that the clock has stopped by comparing the current time to the time indicated in the setup screen or the DOS time when the system boots.
- Implement a comparator circuit with the output connected to the RESIN input of the Élan device to allow comparison of the battery voltage to a reference voltage (2.4 volts) only when the system is powered up by the main power source. Driving a pulse on RESIN will clear the VRT bit, allowing the BIOS to detect any subsequent low battery condition by reading Index Register 0DH, bit 7, (VRT).

**Note:** This workaround requires the BIOS to read Index Register 0DH as opposed to performing a checksum on the RTC RAM. Pulsing RESIN active will clear VRT, but will not clear the RTC RAM contents.

## Backup Battery

The Micro Power Off mode implementation on the Élan device allows the main system power source to be turned off and a backup power source to be switched in to maintain power to the AVCC and VCC pins. Keeping

power applied to the AVCC and VCC pins on the Élan device allows the integrated RTC to remain powered on in Micro Power Off mode, preventing the loss of system time, date & configuration data.

If an RTC backup battery is installed on the system whose power is applied only to the AVCC and VCC pins, when the main power source is not available or is turned off, the Élan device will come up in an undefined state causing power consumption in the mA range which could drain the secondary battery, depending on how long this condition is present.

Once Élan is powered up by the main power source and has properly transitioned to Micro Power Off mode, the undefined condition will not be an issue, as long as the backup power source was installed prior to the transition into Micro Power Off mode. The undefined condition will only occur when power is applied *initially* to the AVCC and VCC pins on the Élan device with the main power source turned off or unavailable.

#### Suggested Workaround:

- During the manufacturing process, install the battery when the system is powered by the main power source prior to the transition into Micro Power Off mode. This will prevent the Élan device from coming up in the undefined state.

**Table 1. Bill of Materials**

Item	Quant.	Ref.	Part
1	1	D1	Schottky diode (RB400D)
2	1	Q1	NPN transistor (2N3904)
3	1	Q2	P-channel MOSFET (SI9430DY)
4	1	R1, R3	10-k $\Omega$ resistor
5	2	R2	51-k $\Omega$ resistor

Figure 1. Clean-Transition Switching Circuit



